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ABSTRACT

A study was conducted to identify pathological Internet users and to reveal their psychological features and problematic usage patterns. One thousand and fifty Taiwanese undergraduates were selected. An Internet Addiction Scale was adopted to classify 648 students into 4 clusters. The 146 users in the 4th cluster, who reported significantly higher degrees of addiction and perceived more negative impacts from using the Internet, were believed to be the at-risk pathological Internet users. These users were further classified into five groups according to their Internet usage, Internet sensation seeking, and perceptions of the Internet. The major finding of this study is that at-risk pathological Internet users can be classified into five subgroups with distinct problematic features. The results suggest that viewing these problematic natures as a cohesive group is inadequate. Pathological Internet users are heterogeneous, engaging in various Internet applications in different intensities, some emphasizing the pleasure or attention driven features, and others seeking stimulating activities and materials. The investigation encourages the awareness of this problem among families, universities, business, and even government offices, with the aim of promoting healthy use of the Internet. (Contains 1 figure, 6 tables, and 27 references.) (JDM)

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Classifying Internet pathological users: Their usage, Internet sensation seeking, and perceptions

Abstract

This pilot study used quantitative methods to identify pathological Internet users and reveal their psychological features and problematic Internet usage patterns. Initially, an Internet addiction scale was adopted to classify 648 college students into 4 clusters. The 146 users in the 4th cluster were believed to be the at-risk pathological Internet users who reported significantly higher degrees of Internet addiction and perceived more negative impacts from using the Internet. Internet usage, perceptions of Internet, and Internet sensation seeking were then employed to regroup the at risk users into 5 groups. The first group comprising 7 "thrill seeking game players" with higher degree of online thrill and adventure seeking spent extensive time online mainly playing various games. Meanwhile, the second group contained 5 "dedicated users seeking pleasure and a sense of community" who spent extremely long online though not for sensational seeking. Instead, they perceived the Internet as a resource for pleasure, rapid channel for communication and gathering information demanding users' whole attention. The third group comprised of 9 "experience seeking email and information users" mainly engaged in using various online materials, email, and talking with major concern on seeking for novel Internet experiences though not necessarily thrill. The fourth group contained 55 "precautious users with thrill seeking tendency" who spent a relatively short time online but sought for highly stimulating Internet activities and they regarded the Internet as

important and attention driven. Finally, the fifth group also spent relatively short time online and showed vague natures in perceptions of the Internet as well as Internet sensation seeking, so the 70 members were coined the "indifferent users". Then, a discriminant analysis was performed to confirm membership along two discriminant functions mainly formed by overall Internet usage and Internet thrill and adventure seeking.

Descriptors: Pathological internet use; Internet addiction; Internet abuse; Addictive behavior; Sensation perception; Usage patterns

Introduction

Since 1996, researchers have examined the existence of excessive use, misuse, or even pathological use of the Internet. Some researchers have coined the radical term "Internet addiction" to describe the disruption to users' lives and the extreme negative consequences (Brenner, 1996, 1997; Egger, & Rauterberg, 1996; Griffths, 1998; Young, 1996a, 1997). In light of this trend, Taiwan researchers (such as Chen, 1998; Chou & Hsiao, 2000; Lin & Tsai, 1999) have also reported on excessive Internet use among Taiwanese university and high school students, finding cross-cultural similarities in problematic Internet use.

The long time spent on-line is merely the surface characteristics of Internet addiction. Internet addicts appear to exhibit symptoms of non-substance addiction according to the screening criteria of Young (1998) which in turn were based on Pathological Gambling described in *DSM-IV* (APA, 1995), i.e., tolerance, compulsive use and withdrawal, and consequent problems. Griffiths (1998) characterized Internet addicts as tending to be "socially unskilled male teenagers who have little or no social life and/or

self confidence, and are described by names such a nerd, geek, and/or anorak (pp. 63)." However, the above stereotype does not always apply, and Young (1996b) reported an Internet addiction case involving a middle-aged housewife in the United States.

Since the characterization of problematic Internet use as a mental disorder requires further evidence, Morahan-Martin & Schumacher (2000) adopted a weaker term, pathological Internet use (PIU), to refer to a general pattern of problematic Internet use. PIU exhibits several symptoms, including mood-altering use of the Internet, failure to fulfil major role obligations, and feelings of guilt and craving by sufferers concerning their Internet use. Morahan-Martin and Schumacher (2000) found some at-risk PI users and described their Internet usage and psychology features in detail. PI sufferers are more likely to be males, technologically sophisticated, involved in real time interactive activities on-line (such as on-line games or MUDs) and technologically sophisticated sites, feel a greater degree of loneliness than the general population, and socially disinhibited online. However, such individuals did not necessarily feel more comfortable and competent online.

Some researchers (Griffiths, 2000; Tsai & Lin, 2000; Young, 1997) have undertaken case studies to reveal different types of pathological Internet users. According to their descriptions, users are likely fall into several types rather than a sole one. For example, Griffiths described a 16-year-old British male who talked to Star Trek fans in a Usenet discussion group. Seekers of virtual sex (Griffiths, 2000; Greenfield, 2000; Hamburger & Ben-Artzi, 2000) and players of Internet games (such as MUD, Kubey, 1996) may be other types.

Our previous studies (Lin and Tsai, 1999; Lin and Tsai, in press) investigated high

school students who were at-risk Internet pathological users. The result indicated that the at-risk users spent excessive time on five Internet applications (WWW, BBS, Email, online Talk, and games) and counted a weekly total of 18 hours on-line. However, the variances of time spent online (for different applications) were very large, sometimes exceeding the means. This pattern revealed that the at-risk individuals used different applications at very different intensities. Morahan-Martin & Schumacher (2000), Chou & Hsiao (2000), and Yang (2001) also reported similar findings in samples of college students. Besides, variances in students' perceptions of the influence of the Internet on their lives were also large. Therefore, it is hypothesized that pathological Internet users appears to be a heterogeneous group with marked individual differences.

In sum, previous research findings and the author's observation suggest that pathological Internet users are heterogeneous who act very differently online, who perceived the Internet differently, and who may be more sensation seeking or disinhibited than normal users. Thus, the goal of this study is to examine whether pathological Internet users can be classified into several groups with distinct characteristics, especially concerning their perceptions of the Internet and sensation seeking while engaging in online activities.

Therefore, this study included a broad range of problematic Internet users and then adopted cluster analyses to differentiate them. Cluster analysis is a set of statistical procedures designed to calculate group distances. The algorithms used in cluster analysis ensure that the members in a particular cluster will share more similarities than members from different clusters. Following the suggestion of Huberty (1994), this study further used discriminant analysis to confirm group membership classified by cluster analysis.

Perceptions towards the Internet, online messages, and activities

Do problematic and normal Internet users perceive the Internet differently? For example, do they particular seek for high stimulating online messages and activities? Do they seek for a sense of control-over or pleasure during using the Internet?

Based on the Gratification theory, Chou & Hsio (2000) found 54 at-risk Internet users (5.9% of 910 college students) in Taiwan who perceived the Internet as much more entertaining, fun, interactive, and satisfying in comparison to other users. Besides these pleasant feelings, the at-risk users viewed the Internet as an escape from real-world responsibilities and roles, a factor which may partly explain their excessive levels of Internet use. The pathological Internet users likely perceived the Internet very differently to the normal users.

In a work examining psychological needs and problematic Internet use among Taiwan college students, Yang (2001) found that 25 at-risk students (3.4% of 727 participants) explored broader ranges of web sites. Meanwhile, the at-risk users also expressed stronger psychological needs, such as for sex, affiliation, achievement, autonomy, and novel experiences, while using the Internet. The psychological features of the at-risk users were likely very different from those of the other.

Surfing the Internet and other online activities are widely viewed as a global high tech adventure, and can be considered a form of sensation seeking. Zuckerman (1979) defined sensation seeking as a trait illustrating "the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experiences" (p.10). Sensation seeking has emerged as capable of explaining

various behaviors, such as drug use, aggression, sex, sky diving, bungee jumping, body-contact sports, hiking and camping, or playing computer and video games (Zuckerman, 1979).

Greenfield's online survey (2000) involved the largest sample of any Internet addiction study to date, indicating that the highest levels of internet utilization appeared to be associated with the most stimulating online materials (for example, sexual content). Consequently, sensation seeking may be one of the underlying causes of excessive Internet use. In investigating 342 undergraduates in an American university, Lavin, Marvin, McLarney, Nola, & Scott (2000) believed that problematic Internet use is positively correlated with sensation seeking. However, their results contradicted this hypothesis. That is, 43 pathological Internet users identified in their study scored significantly lower than others in terms of overall sensation seeking, thrill and adventure seeking, and also experience seeking. Lavin et al. (2000) suggested that the sensation seeking of pathological Internet users may not be physical in nature, such as the thrill seeking behavior involved in bungee jumping, but instead may be mental or virtual.

In another investigation of Internet use and sensation seeking, Lin & Tsai (in press) reported an outcome different from that of Lavin et al.. They found Taiwanese high school students who were at-risk users (N = 88, 11.69% of subjects) obtained significantly higher scores in disinhibition and overall sensation seeking than other users. Disinhibition describes reduced public self-awareness and hence less concern about the judgement of others, meaning conventional constraints become easily ignored. Lin & Tsai (in press) also found that the at-risk users perceived the Internet to have a significantly stronger negative influence on daily routines, school performance, and parental relations

than did ordinary users. In general, to adequately measure the sense of sensational seeking occurring during Internet use, the author suggests develop an innovative measurement tool for virtual sensation seeking.

Research Questions

Based on the above review, the research questions are listed here:

1. Could Internet users be classified into several clusters based on their self-reported Internet addiction?
2. Was it possible to classify the at-risk pathological Internet users by their Internet usage, degree of Internet sensation seeking, and perceptions of the Internet? Specifically, did pathological Internet users show various problematic patterns in use of the Internet? Did pathological Internet users react to and perceive the Internet differently?
3. Among Internet usage, Internet sensation perceptions, and perceptions of the Internet, what variables are most heavily weighted in predicting the group membership of the at-risks? Could the cluster analysis results be confirmed using discriminant analysis?

Methods

Subjects

One thousand and fifty Taiwanese undergraduate students were selected using a cluster sampling method. The undergraduate population in Taiwan was clustered into three demographic areas (northern, central, and southern) within which a further division was made between two types of universities (comprehensive versus technical). Two to four universities were randomly selected from the six clusters, and two to three classes

were randomly selected from each university to form the original subject pool. Meanwhile, data from subjects who had never used the Internet or who left 5 blanks in answering the questionnaire was excluded from further statistical analyses. Consequently, 648 subjects remained in the final sample pool', including 248 males and 400 females, aged from 19 to 26.

Measurements

The subjects completed a questionnaire encompassing four sections, basic information, Internet addiction, perceptions of the Internet, and Internet sensation seeking. The first section of the questionnaire contained 16 questions concerning demographic data, Internet usage, and perceptions of the Internet influences on lives (8-point scale ranging from 1 = positive to 8 = negative).

Second, the Internet Addiction Scale (IAS, Chen, 1998) comprised 2 subscales, Symptoms and Related Problems. The IAS collects subjects' responses regarding problematic Internet use, and is particularly designed to fit the network environment of Taiwan. The IAS contains twenty-six items, each with a scale ranging from 1 (strongly agree) to 4 (strongly disagree). The Symptoms subscale includes 3 factors: Compulsive use, Withdrawal, and Tolerance; while the Related Problems subscale included 2 factors, Time Management problems and Interpersonal/Health problems. A typical item from the Compulsive-use factor notes: "I cannot stop my craving for the Internet.", while an example from the Withdrawal factor states "If I cannot access the Internet or am forced to disconnect, I feel uneasy." Meanwhile, an item from the Tolerance factor states "I need to spend an increasing amount of time on-line to reach the satisfaction level I experienced during my early days of Internet use." An item of Time-management

problem factor is "People have told me that I spend too much time on-line." Finally, the fifth factor describing interpersonal and health problems includes such items as "My health has declined owing to my Internet use."

Though the IAS scale was soundly designed and its validity and reliability were confirmed under rigorous testing (Chen, 1999), the factor structure and reliability were tested again with the current sample. Chen (1999) reported that the IAS scores were significantly correlated with the UCLA loneliness scale and Beck depression scale. Table 1 shows the factor structure and reliabilities of the IAS, correlations among IAS factors, Internet addiction, and Internet usage/experience. While Internet addition was significantly correlated with time online (usage), it was not related to previous Internet using experience (in year) except in the aspects of Interpersonal and Health problems.

(Insert Table 1 about here)

Third, 20 pairs of bipolar adjectives were used to measure users' subjective perceptions towards the Internet on a 9-point scale. A principal component factor analysis with varimax rotation suggested four distinct factors and the results with reliabilities are presented in Table 2. The first factor, "Importance to life", describes the feelings about how meaningful, useful, and critical is it in use of the Internet that accounted for the largest variance explained. "Pleasure" factor describes the degree of happiness or enchantment felt by individuals during their Internet use. Additionally, "Concentration" factor describes the levels of attention required while online. Finally, "Sense of Community" describes the degree to which individuals regards the Internet as a channel for overcoming isolation to communicate with others and gather information.

All factors of perceptions of the Internet were highly correlated with Internet

Addiction Symptoms, but only "Importance to Life" and "Pleasure" factors were related to Internet Addiction Related Problems. Additionally, only "Importance to Life" was correlated with Internet usage and experience.

(Insert Table 2 about here)

Finally, students were asked to rate their sensational seeking while engaging in 15 Internet activities and 7 types of Internet messages using an 8-point scale ranging from 1 = extremely stimulating to 8 = not at all stimulating. A principal component factor analysis with varimax rotation suggested 5 distinct factors and the results are presented in Table 5. The first factor, "Internet thrill and adventure seeking", describes levels of stimulating while playing violent or sexual games, MUD, browsing pornography or gambling websites, positing profane messages, and positing faked or boasting messages that accounted for the largest variance explained. "Internet construction experience seeking" describes the stimulation felt when installing or maintaining web sites, designing homepages, online shopping, and downloading software (ftp). Furthermore, "Sensational information retrieval" includes browsing stocks, humorous materials, online news sites and positing antagonistic messages. "Online acquaintances contacting" describes online talk with acquaintances, sending self-disclosure messages to friends, and connecting friends with whom contact has been lost for years. Finally, "Internet interpersonal adventures" includes online talk with strangers, or switching gender and changing identity while communicating online.

An oneway MANOVA revealed that mean scores of these five factors were different (means = 2.67 ~ 5.27, Hotelling's $t = 3.774$, $df = 4$, $p < .001$) and the post-hoc test showed that stimulating feeling were stronger while engaging in Internet thrill and

adventure seeking, Sensational information retrieving, and Internet interpersonal adventures than engaging in Internet construction experience seeking and Online acquaintance contacting. In addition, all five factors were correlated with Internet Addiction Symptoms and Related Problems, except that Internet construction experience seeking was not correlated with Addiction Symptoms. However, only Internet thrill and adventure seeking and Sensational information retrieving were correlated with time spent online.

(Insert Table 3 about here)

Results

1. **The collegiate Internet users could be separated into 4 clusters based on their self-reported Internet addiction, and 146 members belong to the 4th cluster were possibly the pathological Internet users.**

A cluster analysis was performed using Internet addiction factor scores to separate subjects into 4 clusters (in Table 4). The 4th cluster, containing 146 students, obtained the highest Internet addiction scores in Symptoms and Related Problems subscales as well as in all other factors. Restated, students in the 4th cluster reported to have stronger tendencies of complusive Internet use, withdrawal behaviors, tolerance reactions, and have more severe problems of time management, interpersonal relations and health. Besides, more subjects (n = 41, 28.1%) in the 4th cluster achieved the upper 10% on overall Internet addiction score than subjects (n = 27, 5.4%) in other three groups combined.

(Insert Table 4 about here)

Table 5 lists Internet usage and perceived influence of the Internet among the 4 clusters. The 4th cluster spent the longest in using 4 Internet applications: talking, email, gathering information, and games. Compared with people in other clusters, they regarded that the Internet impacted more negatively on 8 aspects of lives except intimacy. Specifically, they considered the Internet had negative impacts on daily sleep patterns, family relations, daily routine, health, and meal patterns (Means = 5.54 ~ 5.17, in negative side of 8-point scale). However, the Internet had somehow positive impacts, though not as positive as other people felt, on peer relations, school learning, intimacy, and teacher relations (Means = 3.66 ~ 4.19). In general, members in the 4th cluster were more likely to be pathological Internet users. However, within the 4th cluster, individual differences in Internet usage and influence were large suggesting the cluster was heterogeneous in nature.

(Insert Table 5 about here)

2. The at-risk pathological Internet users were further classified into 5 groups according to their Internet usage, Internet sensation seeking, and perceptions of the Internet.

The 146 users in the 4th cluster are more likely to be pathological users with large individual differences. A further grouping method was applied using Internet usage, perceptions of the Internet, and Internet sensation seeking to identify their natures. A cluster analysis was conducted and resulted a 5-group solution as shown in Table 6. Internet usage in the 5 groups varied for all Internet applications, including talk, email, gathering information, and games. Besides, their Internet sensation seeking as well as

perceptions of the Internet were different among 5 groups; while their Internet addiction scores were roughly the same (Fs = 0.684 ~ 2.05, n. s.).

(Insert Table 6 about here)

Seven members (6 males and 1 female) of the 1st group were termed "thrill seeking game players". These individuals spent approximately 53 hours online weekly, mainly playing games (32.5 hours/weekly). These users tended to have higher degree of online thrill and adventure seeking than other at-risk users but their perceptions of the Internet were not markedly distinct.

The members of the 2nd group (N = 5, all males) were named the "dedicated users seeking pleasure and a sense of community". Among all at-risk groups, these users spent the longest time online (105.4 hrs/pw) in all kinds of Internet activities, such as talking (29.3 hrs/pw), playing games (20 hrs/pw), retrieving information (15.6 hrs/pw), and using email (8.3 hrs/pw). This group regarded the Internet as a pleasure resource, communication channel, means of gathering information, and felt it demanded their complete attention. They indulged in a wide range of Internet activities, from gambling, browsing pornography sites and reading electronic news, to posting profane, antagonistic or false messages. Since this group reported medium to low levels of Internet sensation seeking so it is obviously that sensation seeking may not be the main concern to keep them staying extremely long online.

Meanwhile, the individuals in the 3rd group (N = 9, 4 men and 5 women) were categorized as "Experience seeking email and information users". Individuals in this group spent 44.3 hours online weekly, mainly engaged in searching for information (25.4 hrs/pw), email (11 hrs/pw) and online talking (10.9hrs/pw). Additionally, they sought for

novel experiences such as in Internet construction experience seeking, Sensation information retrieval, Online acquaintance contacting, and Internet interpersonal adventures.

The 4th group contained 55 users with 40 men and 15 women who spent online in a relatively short time span (only 10.9 hrs/pw). Assuming they did not conceal online usage, using Internet about 1.4 hour daily can hardly be described as excessive use of the Internet; however, they have already sensed negative impacts of the Internet. Besides, their Internet sensation seeking tendencies were rather strong and they perceived the Internet as important and attention driven. Therefore, they were termed as "Precautious users with thrill seeking tendency".

Finally, the respondents in the 5th group (with the largest sample size = 70, 18 males but 51 females) showed vague natures in Internet usage (12.3 hrs/pw), perceptions of the Internet, and Internet sensation seeking, and thus were termed "indifferent users". The possibility to identify them as pathological Internet users is relatively weak.

In general, though all 146 users reported similar higher tendency of Internet addiction, results of clustering analysis suggested classify them into 5 groups. Also worthy of mention, 18 (85.7%) users in the first three groups admitted to spending too long online or even being addicted, compared to 60 users (about 50%) of the last 2 groups admitting to the same (Chi Square = 19.89, $p < .01$).

3. **Five groups classified by previous cluster analysis were validated through a discriminant analysis, with Internet usage, Internet sensation seeking, and perceptions of the Internet as the independent variables. Two major discriminant**

functions were formed with overall Internet usage and Internet thrill/adventure seeking loaded the heaviest accordingly.

To validate previous cluster analysis, a discriminant analysis was conducted. The results listed in Table 7 revealed that 4 discriminant functions were extracted and the first 2 functions accounted for 89.8% of the variance explained. The chi-square coefficients (437.06 ~ 25.86, *p*s < .01) indicated that these functions differ significantly. Total time spent online weighed most heavily on the first function; Internet thrill and adventure seeking accounted the largest variance in the second function; time spent viewing online information and emails determined the third function; and time of playing games determined the fourth function.

(Insert Table 7 about here)

Figure 1 displays the combined group map of canonical discriminant functions and group centers. This map is also helpful in understanding the features of the 1st to 5th at risk groups. The 1st group is high in function 1 (overall Internet usage) and relatively medium in function 2 (Internet thrill and adventure seeking). Meanwhile, the 2nd group is highest in function 1 but relatively low in function 2. The 3rd group is above average in function 1 but low in function 2, while the 4th group is extremely high in function 2 but very low in function 1. Finally, the 5th group is relatively low in both functions. Regrouping the 146 users using these canonical discriminant functions achieved an acceptable rate of correct classification (95.3% in Table 7). Thus the exploratory grouping results of previous cluster analysis were confirmed.

(Insert Figure 1 about here)

Conclusions and Discussions

The goal of this study is to reveal the differential problematic Internet use patterns and psychological features (especially concerning sensation seeking) of pathological Internet users while participating Internet activities and in use of online materials. Owing to the small sample size of the at-risk users' subgroups (from 5 to 55 individuals), the current results need to be interpreted cautiously.

The major finding of this study is that at-risk pathological Internet users can be classified into five subgroups with distinct problematic features. The first group contained 7 thrill seeking game players and the second group composed of 5 dedicated users seeking pleasure and a sense of community. Meanwhile, the third group contained 9 novel experience seeking Email and information users. The fourth group comprised 55 precautious users who spent relatively short time online than any other at-risk group though reported similar high tendency of Internet addiction. Finally, the last group contained 70 indifferent users whose problematic usage pattern and psychological features were somewhat vague.

Though this study is a pilot to reveal various problematic natures of pathological Internet users, the result suggests viewing them as a cohesive group is inadequate. Such result confirms previous hypothesis or informal observations made by Chou & Hsiao (2000), Greenfield (2000), Griffiths (2000), Morahan-Martin & Schumacher (2000), and Lin & Tsai (in press). Pathological Internet users are heterogeneous for they engaging in various Internet applications in different intensities, some emphasizing on pleasure or attention driven features of Internet, and others seeking for high stimulating online activities and materials.

Gender issue is always one of researchers' focuses in problematic Internet use (Griffiths, 1998; Morahan-Martin & Schumacher, 2000). Excluding the last subgroup of indifferent users, the evidence that male problematic Internet users (n = 55, 72.4%) were much more than women (n =21, 28.6%) is concordance with most findings in this field.

This study made other contributions in developing innovative measurement tools. Because Lavin, et al. (2000) suggests Zuckerman's (1979) original Sensation Seeking Scale presents sensation seeking in more physical sense so it may not adequately measure virtual sensation seeking as how Internet users mentally explore the virtual communities. Therefore this study developed Internet sensation seeking scale. Five factors were extracted and listed from high to low degrees of stimulating, 1) Internet thrill and adventure seeking, 2) sensation information retrieval, 3) Internet interpersonal adventures, 4) online acquaintance contacting, and 5) Internet construction experience seeking. These factors are highly correlated with Internet addiction that displays symptoms of compulsive use, withdrawal, and tolerance, as well as problems of time management, interpersonal and health (Chen, 1999; Young, 1997). Furthermore, the factor of Internet thrill and adventure seeking appears to be a critical variable in classifying at-risk pathological Internet users and not surprisingly highly correlated with the length of overall online usage.

This study also developed a scale of perceptions of the Internet that is similar to what is called Internet attitude (Tsai, Lin, & Tsai, 2001). The Internet attitude defined by Tsai, Lin, & Tsai (2001) composed of 4 factors that are taken directly from computer attitude (Selwyn, 1997): 1) perceived usefulness - measuring students' perceptions about the positive impacts of Internet; 2) affection - assessing anxiety when using Internet; 3)

perceived control - measuring confidence for independent control of Internet used; 4) behavior - assessing students' willingness and frequency of using Internet. However, the functions and features of Internet are different from computers that work alone without connections. The current perceptions of the Internet scale includes 4 factors addressing more about significant features of Internet, such as fun, relax, and attention demanding aspects of the medium and senses of virtual community. Students' attitudes toward Internet may influence their motivation and interests of using and learning Internet, or vice versa (Coffin & MacIntyre, 1999). Therefore, to understand students' perceptions of the Internet is critical for researchers and educators.

Owing to the Internet's recent emergence as a popular media for mass and personal communications as well as its potential to enhance global competitiveness, many governments have strongly advocated Internet use for commercial and educational purposes. Despite widespread positive views of the Internet, policy makers and educators must also realize its negative impacts, especially excessive use of the Internet, related physical and psychological problems, and harm to significant others (Brenner, 1996, 1997; Egger, 1996; Griffths, 1998; Kendall, 1998; Kraut, Patterson, Lundmark, Kiesler, Mukopadhyay, & Scherlis, 1998; Young, 1996a, 1997). The results of this study confirmed that a small sample of undergraduate students have various problems with Internet use. If an undergraduate student spends excessively long online (approximately 7 hours a day or more), he or she inevitably faces difficulties in managing their school commitments and will suffer health problems. This investigation encourages the awareness of this problem among families, universities, business, and even government offices, with the aim of promoting the healthy use of the Internet.

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Table 1: The factor structure of the Internet Addiction Scale and correlation matrix among factors of the Internet Addiction Scale, Internet usage, and experience.

Factor name	Number of items	% Variance Explained	Cronbach Alpha
1. Compulsive Use	5	24.68	0.81
2. Withdrawal	5	19.78	0.70
3. Tolerance	4	17.57	0.73
Total Symptoms	14	62.03	0.87
4. Time Management	5	32.30	0.81
5. Interpersonal & Healthy	7	28.50	0.82
Total Related Problems	12	60.80	0.88

	C	W	TO	TM	IH	SYM	RP	Usage	EXP
Mean	2.05	2.48	2.26	2.00	1.99	31.40	24.40	13.95	2.99
SD	0.56	0.61	0.60	0.63	0.55	6.85	6.07	17.82	1.50
C	-							.251**	-.037
W	.590**	-						.149**	-.028
TO	.590**	.508**	-					.229**	-.045
TM	.615**	.438**	.489**	-				.251**	-.021
IH	.720**	.412**	.485**	.682**	-			.264**	-.079*
SYM	.898**	.806**	.783**	.627**	.676**	-		.244**	-.039
RP	.745**	.501**	.557**	.878**	.915**	.743**	-	.298**	-.045

C: Compulsive Use; W: Withdrawal; TO: Tolerance; TM: Time Management problems; IH: Interpersonal & Health problems; SYM: Symptom; RP: Related Problems; EXP: previous experience of Internet use. * $P < 0.05$; ** $P < 0.01$ (2-tailed tests).

Table 2: Factor structure and reliability of Perceptions of the Internet and correlation matrix for Perceptions of the Internet, online usage, experience, and Internet addiction.

Factor name	Number of items	% Variance explained	Cronbach Alpha
1. Importance to Life	5	17.63	0.89
2. Pleasure	6	17.15	0.86
3. Concentration	5	15.86	0.82
4. Connecting World	4	12.43	0.76
Total Perceptions of the Internet	20	63.08	0.91

	IL	PL	CN	CW	SYM	RP	Usage	EXP
Mean	5.42	5.28	4.69	5.81	31.40	24.40	13.95	2.99
SD	1.13	1.54	1.18	1.19	6.85	6.07	17.82	1.50
IL	-				.356**	.205**	.121*	.122*
PL	.342**	-			.198**	.047	-.013	.022
CN	.496**	.436**	-		.353**	.212**	.002	.045
CW	.422**	.569**	.402**	-	.107**	.021	-.061	.055

IL: Importance to Life; PL: Pleasure; CN: Concentration; CW: Connecting World; SYM: Symptom; RP: Related Problems; EXP: previous experience of Internet use.
* $P < 0.05$; ** $P < 0.01$ (2-tailed tests)

Table 3: Factor structure and reliability of Internet sensation seeking and correlation matrix for Internet Sensation Seeking, online usage, experience, and Internet addiction.

Factor name	Number of items	% Variance explained	Cronbach Alpha
1. Internet thrill and adventure seeking	8	22.05	0.88
2. Internet construction experience seeking	4	12.35	0.83
3. Sensational information retrieval	4	9.85	0.71
4. Online acquaintance contacting	3	9.32	0.70
5. Internet interpersonal adventures	3	7.94	0.70
Total Internet sensation seeking	22	61.51	0.89

	ITAS	SIR	IIA	ICES	OAC	SYM	RP	Usage	EXP
Mean	2.67	3.18	3.51	4.40	5.27	31.40	24.40	13.95	2.99
SD	1.55	1.14	1.64	1.95	1.46	6.85	6.07	17.82	1.50
ITAS	-					.203**	.300**	.120**	.049
SIR	.392**	-				.072	.110**	-.047	.054
IIA	.533**	.328**	-			.159**	.184**	.051	-.023
ICES	.412**	.444**	.324**	-		.190**	.199**	.097*	.097*
OAC	.096*	.241**	.266**	.260**	-	.176**	.110**	.057	-.051

ITAS: Internet thrill and adventure seeking; ICES: Internet construction experience seeking; SIR: Sensation information retrieval; OAC: Online acquaintance contacting; IIA: Internet interpersonal adventures. SYM: Symptom; RP: Related Problems; EXP: previous experience of Internet use. * $p < .05$; ** $p < .01$ (2-tailed tests)

Table 4: Final Cluster Centers using factor scores of Internet addiction as the clustering variables and oneway ANOVA tests.

Factors	Clusters				ANOVA				
	1	2	3	4	Cluster MS	Cluster Df	Error MS	Error Df	F
Compulsive	-0.95	-0.64	0.71	0.20	102.11	3	0.53	644	193.01**
Withdrawal	-0.72	0.68	-0.21	0.59	62.41	3	0.71	644	87.42**
Tolerance	0.18	-1.05	-0.02	0.62	59.04	3	0.73	644	80.92**
Time Management problems	-0.53	-0.74	-0.08	1.21	104.53	3	0.52	644	201.92**
Interpersonal & Health problems	-0.87	-0.45	0.69	-0.00	83.98	3	0.61	644	136.89**
Cluster Size	145	106	251	146					

** $P < 0.01$

Table 5: Oneway ANOVA tests for differences of Internet usage and perceptions of Internet influences on lives among 4 clusters.

	Cluster 1 N=145		Cluster 2 N=106		Cluster 3 N=251		Cluster 4 N=146		F
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
Total Usage	9.84	11.18	7.80	7.53	15.85	19.87	18.93	21.99	11.70**
Information usage	5.01	7.68	3.91	4.69	6.16	8.20	6.62	7.73	3.14*
Game usage	2.37	6.56	1.60	3.55	2.97	5.85	5.18	9.87	5.60**
Talk usage	2.17	7.42	1.81	2.94	3.70	6.68	4.94	7.75	5.81**
Email usage	2.90	5.77	2.46	3.91	3.00	2.97	3.48	4.45	1.16
Influence on sleep patterns	4.10	1.91	4.29	1.79	4.80	1.68	5.54	1.77	18.62**
Influence on family	3.70	1.81	3.77	1.69	4.23	1.46	5.44	1.64	7.07**
Influence on daily routine	3.90	1.71	4.14	1.66	4.72	1.63	5.31	1.73	20.08**
Influence on health	3.97	1.85	4.31	1.77	4.71	1.66	5.29	1.72	15.46**
Influence on meal patterns	3.83	1.72	3.98	1.76	4.49	1.61	5.17	1.60	15.99**
Influence on intimacy	3.65	1.84	3.75	1.75	3.96	1.55	4.19	1.74	2.04
Influence on teacher relations	3.56	1.83	3.72	1.64	4.10	1.54	4.11	1.64	4.54**
Influence on learning	2.48	1.60	3.10	1.84	3.63	1.94	3.85	1.99	16.47**
Influence on peer relations	3.17	1.67	3.17	1.62	3.60	1.48	3.66	1.70	4.19**

* $p < .05$; ** $p < .01$

Table 6: Final cluster centers using online usage, perceptions of the Internet, and Internet sensation seeking as the clustering variables, with oneway ANOVA tests.

	Groups					ANOVA				
	1 Thrill seeking game players	2 Dedicated users	3 Experience seeking Email/info Users	4 Precautious users with thrill seeking tendency	5 Indifferent users	Cluster MS	Cluster df	Error MS	Error df	F
Sample size	7	5	9	55	70					
Total usage	52.9	105.4	44.3	10.9	12.3	14454.30	4	84.21	140	171.65**
Talk	3.8	29.3	10.9	3.4	4.0	720.92	4	39.89	131	18.07**
Email	1.1	8.3	11.0	2.6	3.1	172.10	4	15.21	133	11.31**
Info	9.8	15.6	25.4	5.3	4.3	932.81	4	32.22	127	28.95**
Games	32.5	20.5	5.4	5.1	1.3	1573.00	4	46.10	115	34.13**
PL	24.29	30.40	30.33	28.85	23.17	316.87	4	83.58	138	3.79*
IM	14.57	14.20	16.88	17.85	16.31	35.79	4	56.69	138	.63
CN	27.29	29.40	28.33	28.93	27.19	27.01	4	10.26	141	2.63*
CW	10.43	11.80	8.89	9.40	7.23	59.83	4	13.20	141	4.53*
ITAS	36.43	32.00	27.75	36.74	14.36	3990.71	4	57.23	134	69.73**
SIR	10.43	12.00	15.00	15.60	12.31	105.40	4	19.56	137	5.39**
IIA	13.57	11.60	15.00	13.80	9.74	157.57	4	21.85	141	7.21**
ICES	20.00	21.20	23.67	21.32	17.97	124.50	4	50.18	138	2.48*
OAC	15.86	14.80	17.89	16.57	17.13	11.77	4	14.75	140	.80

* $p < .05$; ** $p < .01$

IL: Importance to Life; PL: Pleasure; CN: Concentration; CW: Connecting World; ITAS: Internet thrill and adventure seeking; ICES: Internet construction experience seeking; SIR: Sensation information retrieval; OAC: Online acquaintance contacting; IIA: Internet interpersonal adventures.

Table 7: Results of discriminant analysis to categorize at risk pathological Internet users into 5 subgroups by Internet usage, Internet sensation seeking, and perceptions of the Internet with cross validation of membership.

Summary of Canonical Discriminant Functions				Structure Matrix: Absolute Correlation between Variables and Discriminant Functions				
Functions	Eigen Value	Cum. %	Canonical Correlation	Overall usage	ITAS	Game usage	Info usage	Email usage
1	8.33	61.7	.945	.923*	.124	.346	.219	.131
2	3.81	89.8	.890	-.096	.935*	.306	-.035	-.126
3	1.04	97.6	.715	.245	.214	-.338	.617*	.578*
4	0.33	100.0	.497	-.210	-.237	.771*	.591	.070

Classification Result [a]	Predicted Group Membership					
	1st group	2nd group	3rd group	4th group	5th group	N [b]
1st group	**6(100%)**	0	0			6
2nd group	0	**4(100%)**	0	0	0	4
3rd group	0	0	**6(100%)**	0	0	6
4th group	0	0	0	**35(87.5%)**	5(12.5%)0	40
5th group	0	0	0	0	**62(100%)**	62

* Largest absolute correlation between each variable and a discriminant function.

[a] 95.3% of original grouped cases correctly classified.

[b] Users with missing data in the independent variables were excluded from this analysis.

ITAS: Internet thrill and adventure seeking.

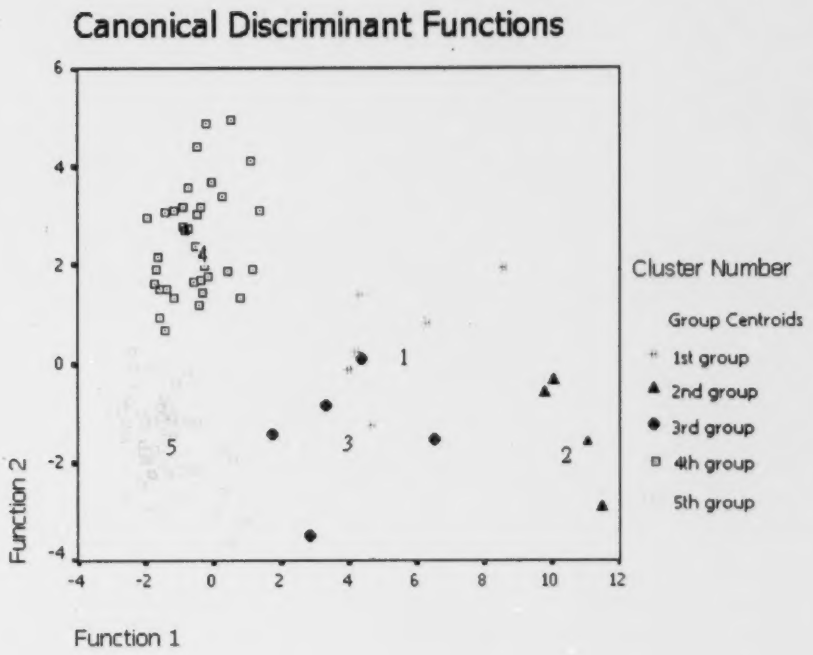

Figure 1: Canonical discriminant functions for pathological Internet user groups. 1st group: Thrill seeking game players; 2nd group: Dedicated users seeking pleasure and a sense of community; 3rd group: Experience seeking email/information users; 4th group: Precautious users with thrill seeking tendency; and 5th group: Indifferent users.

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i. This data set contains several sections which will be presented in several papers forth coming.